SYSTEMATIC STATUS OF *KANKANOPHRYNE* HEYER & LIEM (ANURA: LEPTODACTYLIDAE)

by M. J. Tyler & Margaret Davies*

Summary

Tyler, M. J. & Davies, M. (1980) Systematic status of *Kankanophryne* Heyer & Liem (Anura: Leptodactylidae). *Trans. R. Soc. S. Aust.* **104**(1), 17-20, 29 February, 1980.

The diagnostic characters of *Kankanophryne* Heyer & Liem (1976) that distinguish it from *Pseudophryne* Fitzinger (1843) were stated to be the form of the sacral diapophyses and the number of slips of the Musculus depressor mandibulae. Our survey of these features in the two genera fails to support any distinction; hence we propose that *Kankanophryne* be referred to the synonymy of *Pseudophryne*.

Introduction

Heyer & Liem (1976) undertook an analysis of intergeneric relationships in Australian myobatrachid (leptodactylid) frogs. Amongst their consequent proposals was the erection of the genus *Kankanophryne* for *Pseudophryne occidentalis* Parker, described from Western Australia (Parker 1940) and reported from South Australia by Tyler (1972). The rationale for Heyer & Liem's action was the stated existence in *P. occidentalis* of a small series of character states not shared by congeners. The authors stated that these were "differences best reflected at the generic level" (1976, p. 5).

Tyler (1978) failed to adopt the new generic name, but Cogger (1978) has included *Kankanophryne* in the revised edition of his "Reptiles and Amphibians of Australia". Because our observations on the definitive characteristics involved are at variance with those published by Heyer & Liem, we present these data here to clarify the systematic status of *Kankanophryne*.

Our retention of the name Leptodactylidae instead of adopting Myobatrachidae reflects the absence of morphological substantiation for the latter step. This matter is discussed in detail by Tyler (1979).

Material and Methods

We have examined the external features, myology and osteology of representatives of the following species: *Pseudophryne bibroni* Günther, *P. coriacea* Keferstein, *P. guentheri* Boulenger, *P. occidentalis* and *P. semimarmorata* Lucas. Specimens are deposited in the collections of the South Australian Museum (SAM), Western Australian Museum (WAM) and Department of Zoology, University of Adelaide (UAZ).

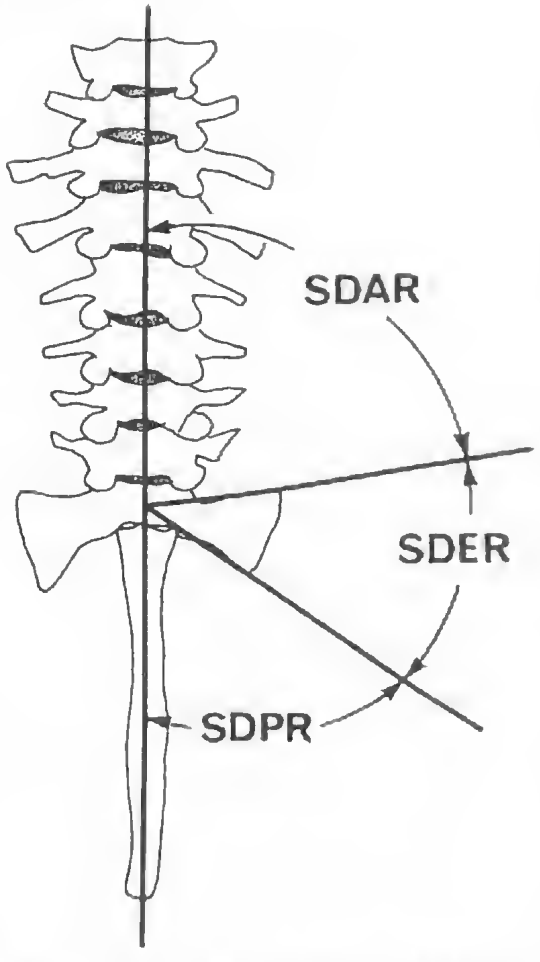

Fig. 1. Angles of sacral diapophyses measured. SDAR: anterior angle of right sacral diapophysis; SDER: greatest expansion of right sacral diapophysis; SDPR: posterior angle of right sacral diapophysis.

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Muscles were examined with the aid of the iodine/potassium iodide stain developed by Bock & Shear (1972). Bones and cartilage were examined employing either cleared and Alizarin Red staining or the differential Alizarin Red/Alcian Blue stain (Davis & Gore 1947; Dingerkus & Uhler 1977). The method of measurement of sacral diapophyseal angles follows Trueb (1977) and is demonstrated in Fig. 1.

Generic diagnoses

Heyer & Liem's diagnoses of *Pseudophryne* Fitzinger and *Kankanophryne* are identical in the condition of the following features: separation of cervical cotyles, lack of Musculus omohyoideus, lack of columella, texture of belly skin, form of toes, presence of metatarsal tubercle and mode of reproduction.

The diagnoses differ in the following respects:

Vomerine bones. Present or absent in *Pseudophryne;* absent in *Kankanophryne.*

Sacral diapophyses: Broad in *Pseudophryne;* narrow in *Kankanophryne.*

Depressor mandibulae: Slip from dorsal fascia absent in *Pseudophryne;* present in *Kankanophryne.*

It follows that the critical characteristics for the recognition of *Kankanophryne* are the conditions of the sacral diapophyses and depressor mandibulae.

Expansion of sacral diapophyses

The definition of character state 12 in Heyer & Liem's paper is as follows: State 0: sacral diapophyses expanded; State 1: sacral diapophyses rounded uniformly, in at least some species. They then proceed to score *P. occidentalis* as State 1 and the remaining species of *Pseudophryne* as State 0. Generic descriptions of *Kankanophryne* and *Pseudophryne* refer to "narrow" and "broad" sacral diapophyses respectively.

The majority of anurans have moderately expanded sacral diapophyses (designated "dilated" by Trueb (1973)). Amongst the Ranidae, however, the sacral diapophyses are narrow and usually directed posterolaterally whereas at the other extreme of the spectrum (in the Bufonidae), sacral diapophyses are very broadly expanded. Lynch (1971) considered that any distinction between the degree of dilation of the sacral diapophyses exhibited by some of the Australopapuan leptodactylid genera he examined, is a very fine one and probably is not defensible. Trueb's (1977) investigation into the osteology of a population of *Hyla lanciformis* (Cope) indicated that a degree of uncertainty exists about the reliability of vertebral characters. Vertebral anomalies are common amongst anurans, particularly in the form of bilateral asymmetry, and presence of additional features such as transverse processes on the coccyx in some individuals (unpublished observations). Trueb (1977) observed that a low coefficient of variability in the shape and orientation of the anterior edge of the sacral diapophyses occurred in her study population, indicating that some sacral features are reliable for systematic purposes.

We have carried out Trueb's measurements on the species examined by us and the results are shown in Table 1. The vertebral columns

TABLE 1. *Measurements of sacral diapophyses (see Fig. 1) in individuals of* Pseudophryne *and* Kankanophryne.

Species	Sacral angle measurement in degrees					
	SDAL	SDAR	SDEL	SDER	SDPL	SDPR
P. bibroni	83.5	75.0	41.0	49.5	55.5	55.5
P. coriacea	68.5	72.0	49.0	39.5	62.5	68.5
P. guentheri	82.5	85.5	50.0	39.0	47.5	55.5
P. semimarmorata	69.5	74.5	53.5	43.0	57.0	62.5
K. occidentalis	80.0	78.5	49.0	52.5	51.0	49.0

SDAL(R): Anterior angle of left (right) sacral diapophysis; SDEL(R): Greatest expansion of left (right) sacral diapophysis; SDPL(R): Posterior angle of left (right) sacral diapophysis.

of the species considered are shown in Fig. 2. Whilst recognising that the measurements in Table 1 have been made on individuals rather than populations, it can be seen that there is no significant difference in the expansion of the sacral diapophyses between *P. occidentalis* and the other species of *Pseudophryne* examined by us. We can find no justification for Heyer and Liem scoring the expansion of the sacral diapophyses in *P. occidentalis* as "narrow" in comparison with other *Pseudophryne.*

Depressor mandibulae

Griffiths (1954, 1959) demonstrated the existence of interspecific divergence in the form of the M. depressor mandibulae, and the way in which this divergence could be employed for systematic purposes. Griffiths

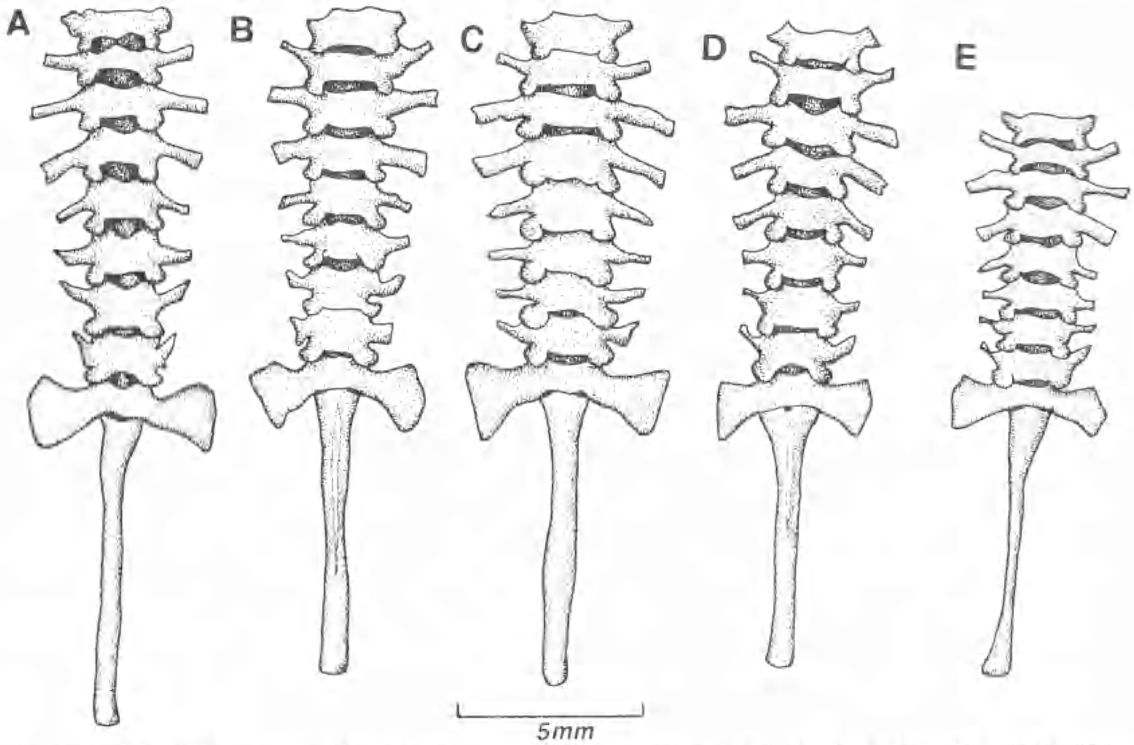

Fig. 2. Vertebral columns of (A) *Pseudophryne semimarmorata* UAZ B536, Koonwarra, Vic.; (B) *P. occidentalis*, SAM R17522, approx. 100 km S of Balladonia Hotel, W.A. (33°13'S, 123°27'E); (C) *P. guentheri*, UAZ B539, Forrestfield, W.A.; (D) *P. bibroni*, UAZ A577, Tandanya Farm, Kangaroo Is.; (E) *P. coriacea*, UAZ B537, Conondale Ra., Qld. Note similarity of shape of sacral diapophyses and the numerous examples of vertebral bilateral asymmetry.

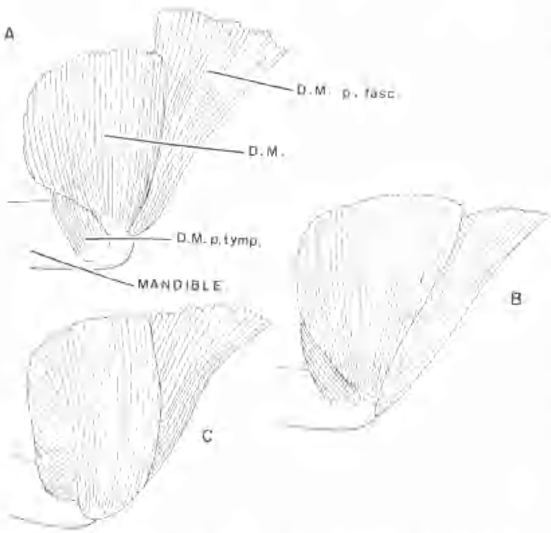

Fig. 3. Lateral view of Depressor mandibulae muscles. A: *Pseudophryne semimarmorata*; B: *P. bibroni*; C: *P. occidentalis*. A slip of the muscle occurs upon the dorsal fascia in each species. D.M.: main squamosal/otic element of depressor mandibulae; D.M.p.fasc.; depressor mandibulae pars fascialis; D.M.p.tymp.: depressor mandibulae pars tympanicus.

recognised three conditions in the origin of this muscle: (a) arising from the posterior border of the otic arm of the squamosal, (b) arising from the squamosal and the dorsal fascia and, (c) arising from the dorsal fascia alone.

In some respects this descriptive system represents a simplification because the muscle commonly comprises three elements: the third arising from the tympanum and termed the "pars tympanicus".

Lynch (1971) examined the condition of the depressor mandibulae in *P. bibroni* and *P. corroboree* and reported that the genus has only one slip — the pars tympanicus.

Our studies do not support the observations of Lynch or those of Heyer & Liem. As illustrated in Fig. 3, each of the species examined by us has large squamosal and dorsal fascial elements. The relative size of the dorsal fascia element in *P. occidentalis* is intermediate between that exhibited by *P. bibroni* and that in the type species *P. semimarmorata*. In *P. guentheri* the M. depressor mandibulae resembles the condition in *P. bibroni* except that the slip to the dorsal fascia is slightly smaller.

Discussion

Our observations indicate that the form of the M. depressor mandibulae and sacral diapophyses of *P. occidentalis* cannot be distinguished from the condition exhibited by the type species of *Pseudophryne* (*P. semimarmorata*). *Kankanophryne* was erected on the premise that the species differed substantially from *Pseudophryne,* but we are unable to support its maintenance, and we propose that *Kankanophryne* be referred to the synonymy of *Pseudophryne.*

Acknowledgments

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